F2 Labs
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CERTIFICATION TEST REPORT

Manufacturer:	**Sports Sensors, Inc.** **7260 Edington Drive** **Cincinnati, Ohio 45249-1063 USA**
Applicant:	**Same as Above**
Product Name:	Swing Speed Radar with Tempo Timer RDL; Swing Speed Radar RDL
Product Description:	Multi-Sports Doppler Speed Measuring Device with Bluetooth Data Link
Operating Voltage/Freq. of EUT During Testing:	Battery-Operated
Model(s):	**RDL-SSR364*** **Denotes actual model tested as worst-case representative of product family that includes Swing Speed Radar RDL model RDL-SSR364 and Swing Speed Radar with Tempo Timer RDL model RDL-SSRTT364.*
FCC ID:	**NVE364BT**
Testing Commenced:	2023-11-21
Testing Ended:	2023-11-22
Summary of Test Results:	**In Compliance** The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications and/or manufacturer's statement. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Rules:

- **FCC Part 15 Subpart C, Section 15.245**
- **FCC Part 15.31(e)**
- **ANSI C63.10:2013**

Evaluation Conducted by:

Julius Chiller, Senior Wireless Project Engineer

Report Reviewed by:

Ken Littell, Vice President of Operations

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1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD**.**

1.2 Measurement Procedure:

All measurements were performed according to ANSI C63.10 and recommended FCC procedure of measurement of DTS operating under Section 15.247 and in KDB558074. A list of the measurement equipment can be found in Section 6.

1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used, and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data and are expressed with a 95% confidence factor. Note: Only measurements listed below which relate to tests included in this Test Report are applicable to it.

Measurement Range	Expanded Uncertainty	Combined Uncertainly
Radiated Emissions <1 GHz @ 3m	±5.07dB	±2.54
Radiated Emissions <1 GHz @10m	±5.09dB	±2.55
Radiated Emissions 1 GHz to 2.7 GHz	±3.62dB	±1.81
Radiated Emissions 2.7 GHz to 18 GHz	±3.10dB	±1.55
AC Power Line Conducted Emissions, 150kHz to 30 MHz	±2.76dB	±1.38

This Uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.4 Document History

Document Number	Description	Issue Date	Approved By
F2P31012-02E	First Issue	2023-12-18	K. Littell

2 SUMMARY OF TEST RESULTS

Test Name	Standard(s)	Results
Field Strength of Emissions	CFR 47 Part 15.245(a)(b)	Complies
Voltage Variations	CFR 47 Part 15.31(e)	Complies*
Radiated Spurious Emission	CFR 47 Part 15.245(b)(3) / Part 15.209	Complies

**EUT is battery-operated with no provision for charging.*
Tested with new AA cell batteries (3).
Requirements of 15.31 were met by using new batteries.

Modifications Made to the Equipment
None

3 TABLE OF MEASURED RESULTS

Test	10545.7 MHz
Average Field Strength of Fundamental	86.2dBµV/m, 20.4 mV/m
Average Limit for Fundamental	128 dBµV/m ,2500 mV/m

4 ENGINEERING STATEMENT

This report has been prepared on behalf of Sports Sensors, Inc., to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15.245 of the FCC Rules using ANSI C63.10 standards. The test results found in this test report relate only to the items tested.

5 EUT INFORMATION AND DATA

5.1 Equipment Under Test:

Product: Swing Speed Radar with Tempo Timer RDL
Model: RDL-SSR364*
**Denotes actual model tested as worst-case representative of product family that includes Swing Speed Radar RDL model RDL-SSR364 and Swing Speed Radar with Tempo Timer RDL model RDL-SSRTT364.*
Serial No.: 7CBB36
BT Firmware: v0.14
BT Hardware: v0.10
SSR Firmware: 66781901
SSR Hardware: V1.0
FCC ID: NVE364BT

5.2 Trade Name:

Sports Sensors, Inc.

5.3 Power Supply:

Battery-Operated; no provision for charging.

5.4 Applicable Rules:

CFR 47, Part 15.245

5.5 Equipment Category:

Radio Transmitter-DTS

5.6 Antenna:

Integral Antenna

5.7 Accessories:

N/A

5.8 Test Item Condition:

The equipment to be tested was received in good condition.

5.9 Testing Algorithm:

EUT was transmitting a continuous CW carrier in the 10.5 to 10.55 GHz band. EUT is a single-channel unit.

6 LIST OF MEASUREMENT INSTRUMENTATION

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber	CL166-E	Albatross Projects	B83117-DF435-T261	US140023	2024-11-15
Shielded Chamber 2018	CL251-E-3m	AlbatrossProjects	US170028	B83117-FG639-T261	2024-11-08
Temp/Hum. Recorder	CL293	Thermpro	TP50	1	2025-05-31
Temp/Hum. Recorder	CL296	Thermpro	TP50	4	2026-04-27
Receiver	CL151	Rohde & Schwarz	ESU40	100319	2024-04-10
Antenna, JB3 Combination	CL175	Sunol Sciences	JB3	A030315	2024-09-25
Amplifier w/Monopole & 18" Loop	CL163-Loop	A.H. Systems, Inc.	EHA-52B	100	2024-12-14
Low Loss Cable Set	CL315	Fairview Microwave	FMC0202914-240	None Spec.	2024-04-14
Horn Antenna	CL098	Emco	3115	9809-5580	2024-01-19
Pre-Amplifier	CL153	Keysight Tech.	83006A	MY39500791	2023-12-16
Pre-Amplifier	CL136	Hewlett Packard	8447E	1937A01894	2024-04-12
Horn Antenna 18-26.5 GHz	CL114	A.H. Systems, Inc.	SAS-572	237	2023-12-31
Pre-Amplifier	CL189	Com-Power	PAM-840A	461303	2024-06-14
Horn Antenna 26.5-40 GHz	CL188	Com-Power	AH-640	091065	2023-11-30
Software:	Tile Version 3.4.B.3.		Software Verified: 2023-11-21 to 2023-11-21		
Software:	EMC 32, Version 8.53.0		Software Verified: 2023-11-21 to 2023-11-21		
Software	EMC 32, Version 10.60.20		Software Verified: 2023-11-21 to 2023-11-21		

7 FIELD STRENGTH OF EMISSIONS FROM INTENTIONAL RADIATORS

(a) Operation under the provisions of this section is limited to intentional radiators used as field disturbance sensors, excluding perimeter protection systems.

(b) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902-928	500	1.6
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25.0
24075-24175	2500	25.0

(1) Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in § 15.205, shall not exceed the field strength limits shown in § 15.209. Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:
   (i) For the second and third harmonics of field disturbance sensors operating in the 24075–24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.
   (ii) For all other field disturbance sensors, 7.5 mV/m.
   (iii) Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands, other than the second and third harmonics from devices operating in the 24075–24175 MHz band, fully comply with the limits given in § 15.209. Continuous operation of field disturbance sensors designed to be used in farm equipment, vehicles such as fork lifts that are intended primarily for use indoors or for very specialized operations, or railroad locomotives, railroad cars and other equipment which travels on fixed tracks is permitted. A field disturbance sensor will be considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g., putting a vehicle into reverse gear, activating a turn signal, etc.).

(2) Field strength limits are specified at a distance of 3 meters.

(3) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

(4) The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in § 15.35 for limiting peak emissions apply.

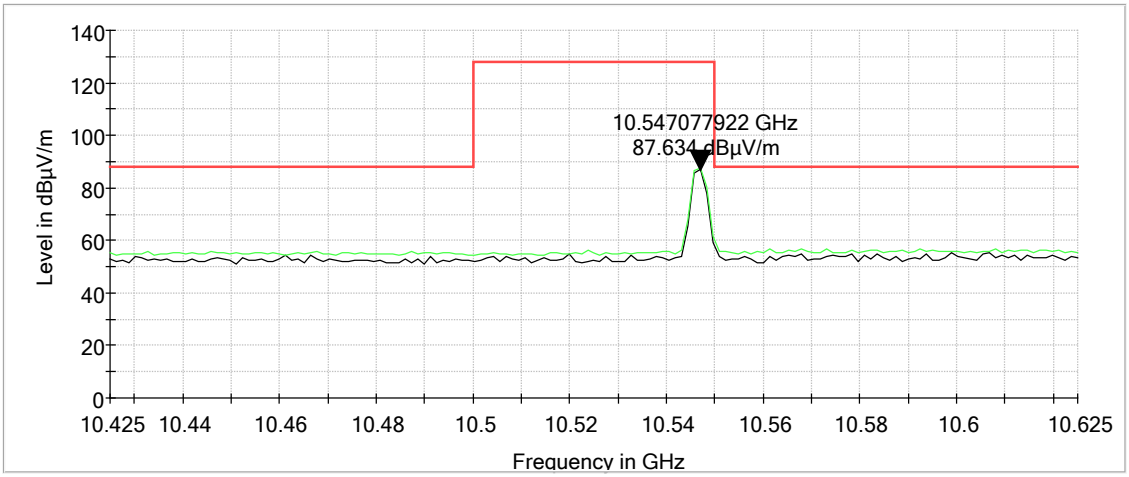
NOTE: During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions.

7.1 Test Data - Field Strength of Emissions from Intentional Radiators

Test Date(s):	2023-11-21	**Test Engineer(s):**	J. Chiller
Standards:	CFR 47 Part 15.245/15.209	**Air Temperature:**	22.6ºC
		Relative Humidity:	38%

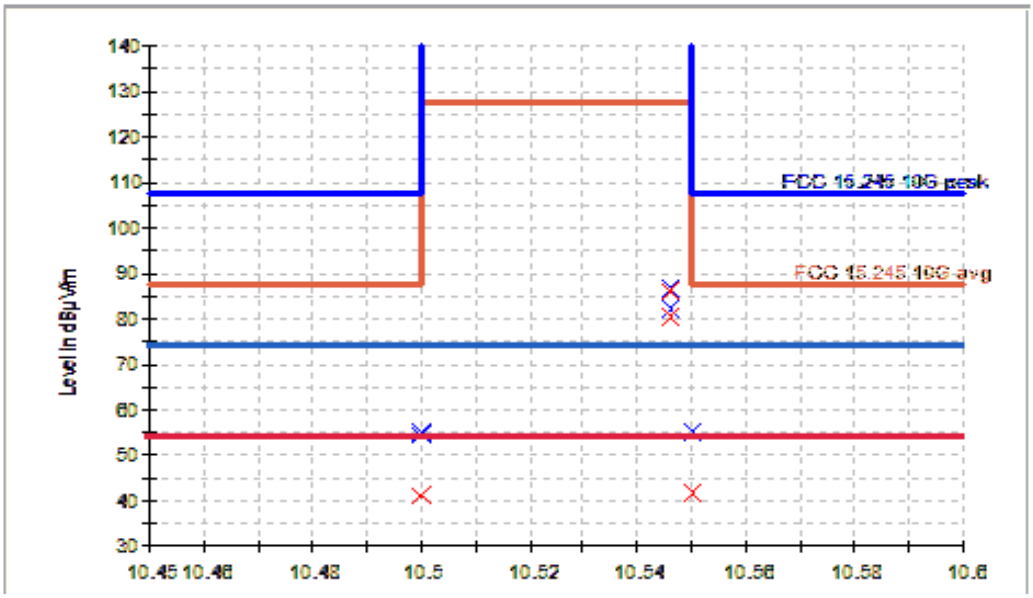
Band Edges: Vertical

Band Edges: Horizontal



Band Edge and Field Strength of the Fundamentals

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
10500.000000	55.0	41.3	1000.0	1000.000	150.0	V	24.0	19.8	12.7	54.0
10500.000000	54.3	41.3	1000.0	1000.000	150.0	H	74.0	19.8	12.7	54.0
10545.770000	82.2	80.7	1000.0	1000.000	150.0	H	74.0	19.9	47.3	128.0
10545.770000	86.6	86.2	1000.0	1000.000	150.0	V	24.0	19.9	41.8	128.0
10550.000000	54.7	41.7	1000.0	1000.000	150.0	H	74.0	19.9	12.3	54.0
10550.000000	55.2	41.8	1000.0	1000.000	150.0	V	24.0	19.9	12.2	54.0



7.2 Test Data – Spurious Emissions

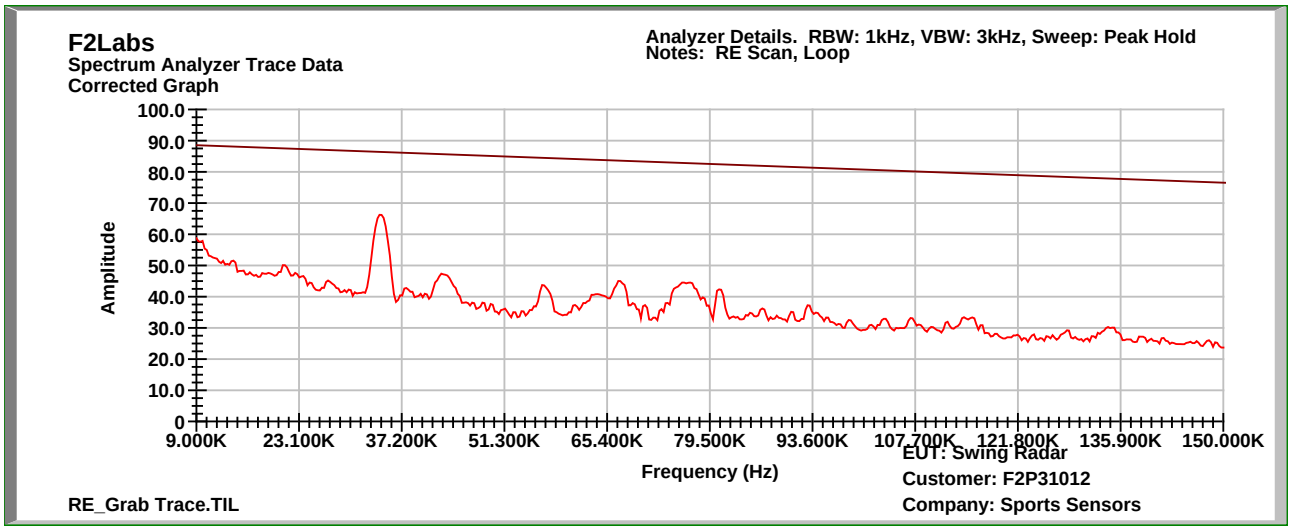
Notes: Plots are peak, max hold pre-scan data included only to determine what frequencies to investigate and measure. During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. At some frequencies, no emissions from the EUT were measurable over the ambient noise floor. The readings did not change with EUT on and EUT off.

At least 6 of the highest frequencies were measured per ANSI 63.4 in a 3-meter anechoic chamber. Frequencies below 1 GHz were measured using a quasi-peak detector. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions. Some of the frequencies did not change with the EUT on or off. At those frequencies, the test distance was shortened to 1 meter and still no emissions from the EUT were visible or over the ambient or limit. Frequencies were scanned from 9kHz to 40 GHz and the highest emissions are listed below.

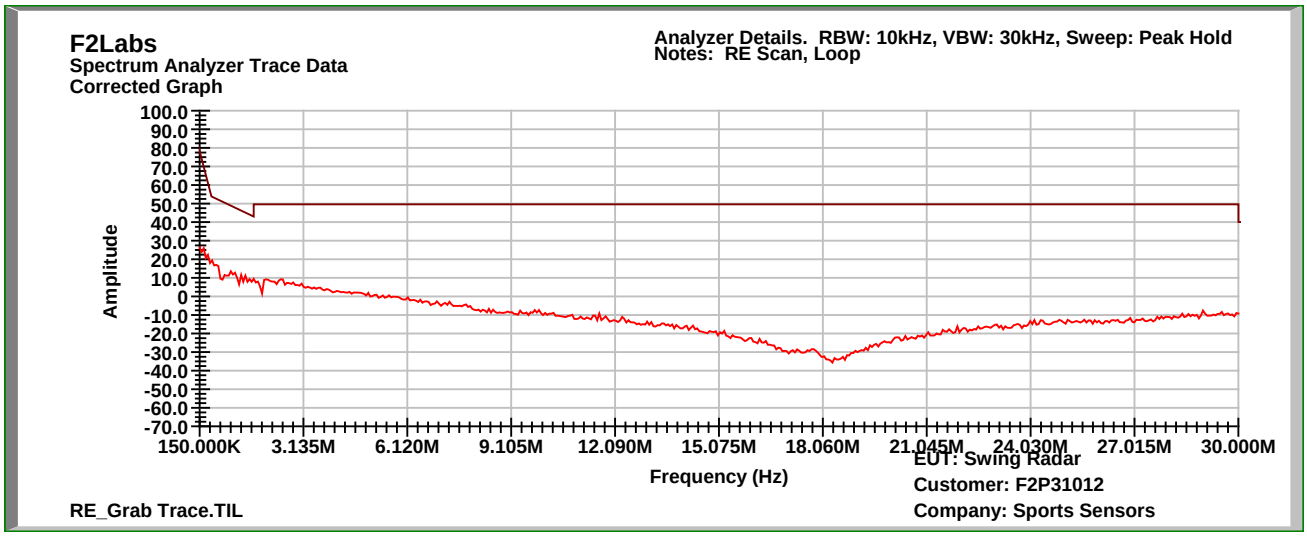
In the following plots, the black line indicates ambient noise and the red line indicates the measurement with the EUT on. Emissions to be found by the EUT were measured and listed in tables below.

Test Date(s):	2023-11-21 to 2203-11-22	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.245/15.209	Air Temperature:	22.2ºC
		Relative Humidity:	37%

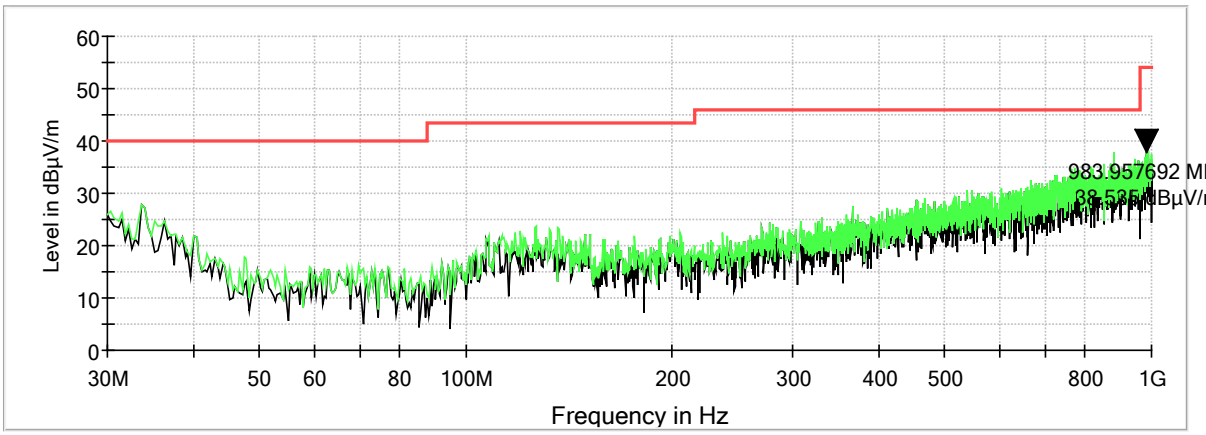
Characterization Scan, 9 kHz to 150 kHz



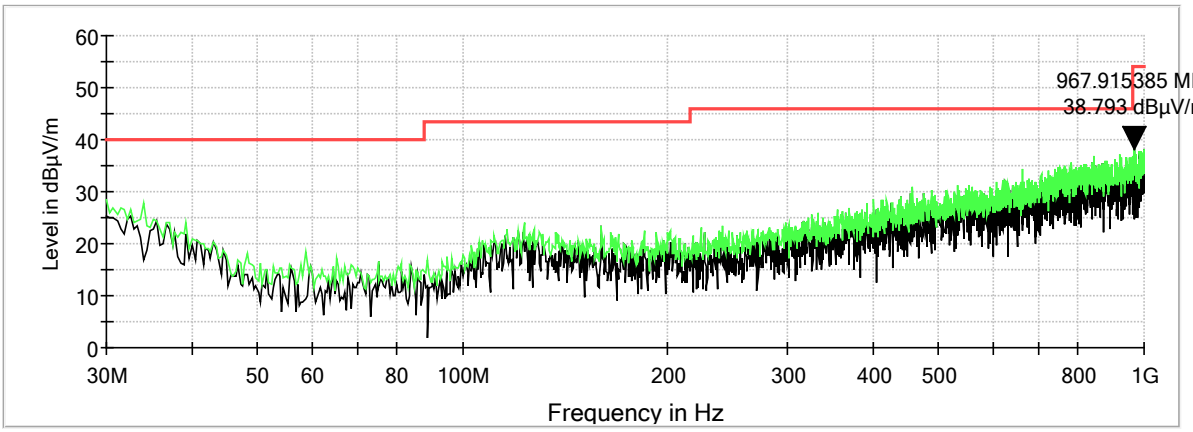
Characterization Scan, 150 kHz to 30 MHz



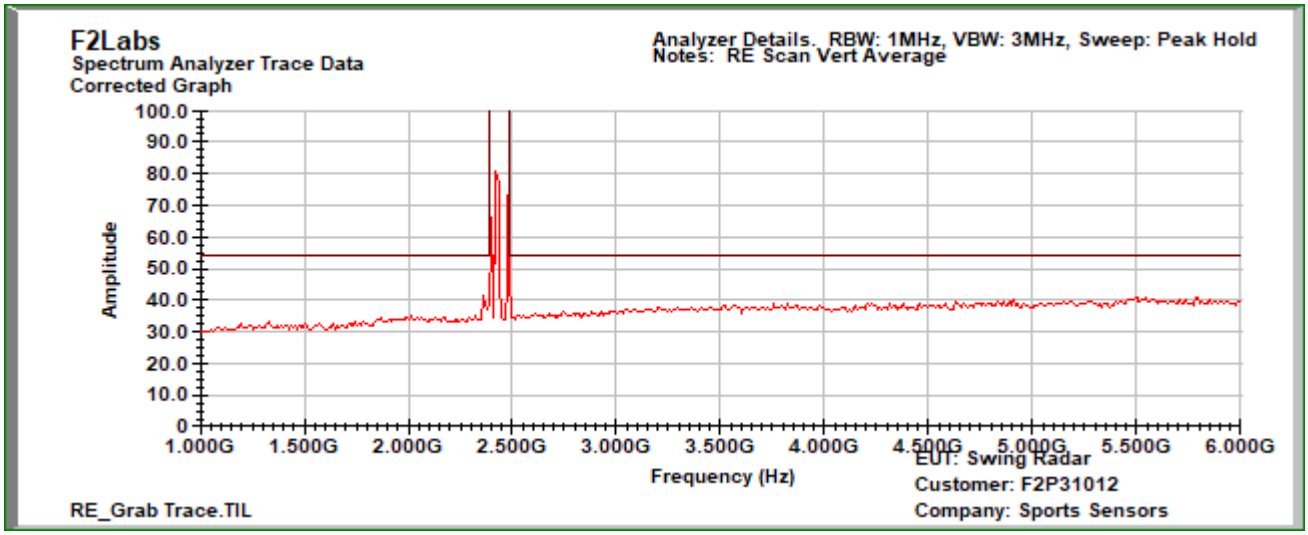
30 MHz to 1000 MHz - Vertical



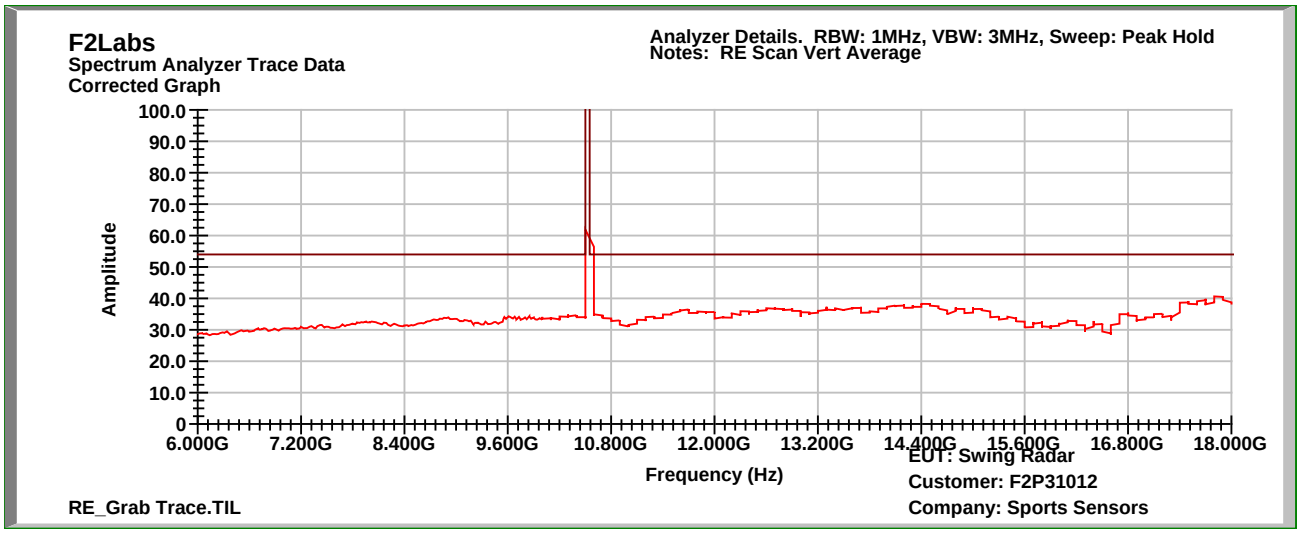
30 MHz to 1000 MHz - Horizontal



1 GHz to 6 GHz, Vertical

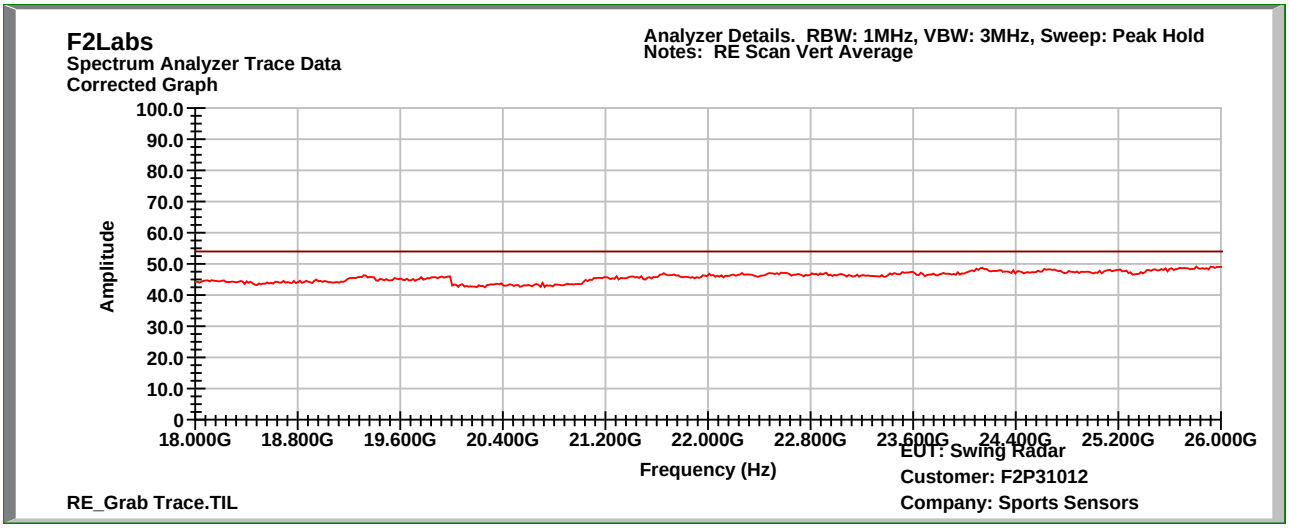


6 GHz to 18 GHz, Vertical

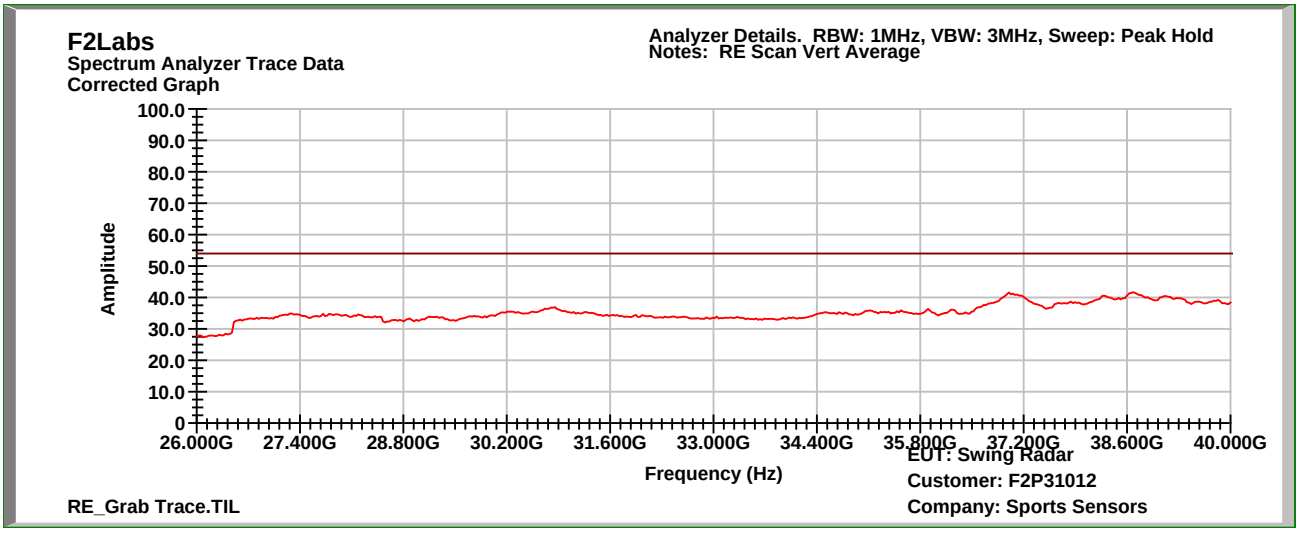


Note: The emissions seen in the 2.4 GHz range are the fundamental frequencies from a certified Bluetooth module inside the product. Those emissions are intentional radiator emissions and not spurious.

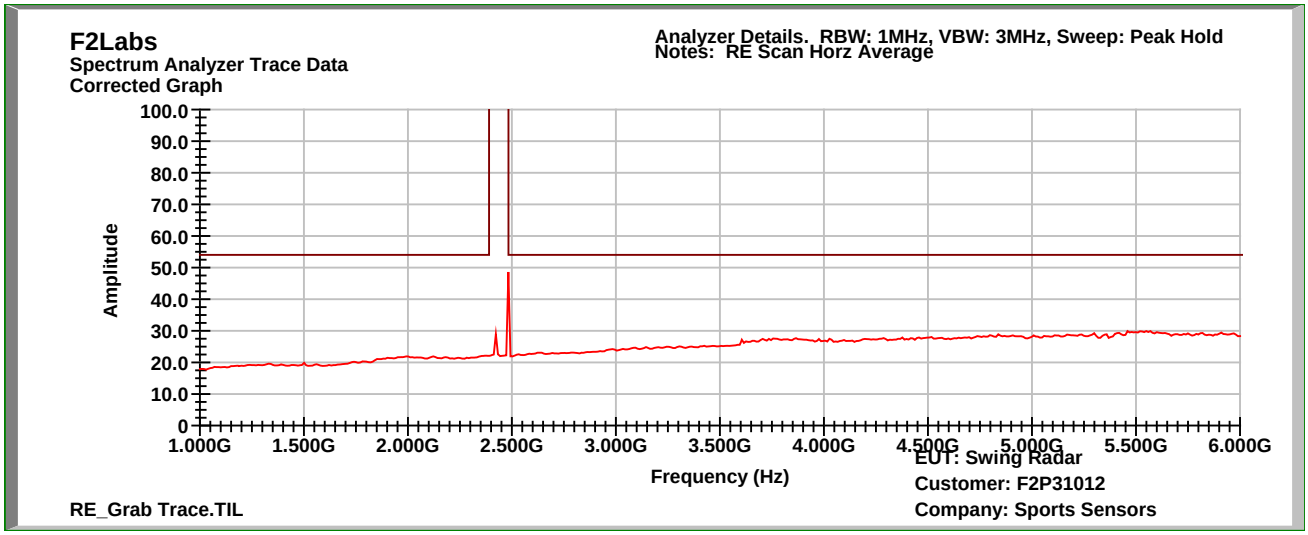
18 GHz to 26 GHz, Vertical



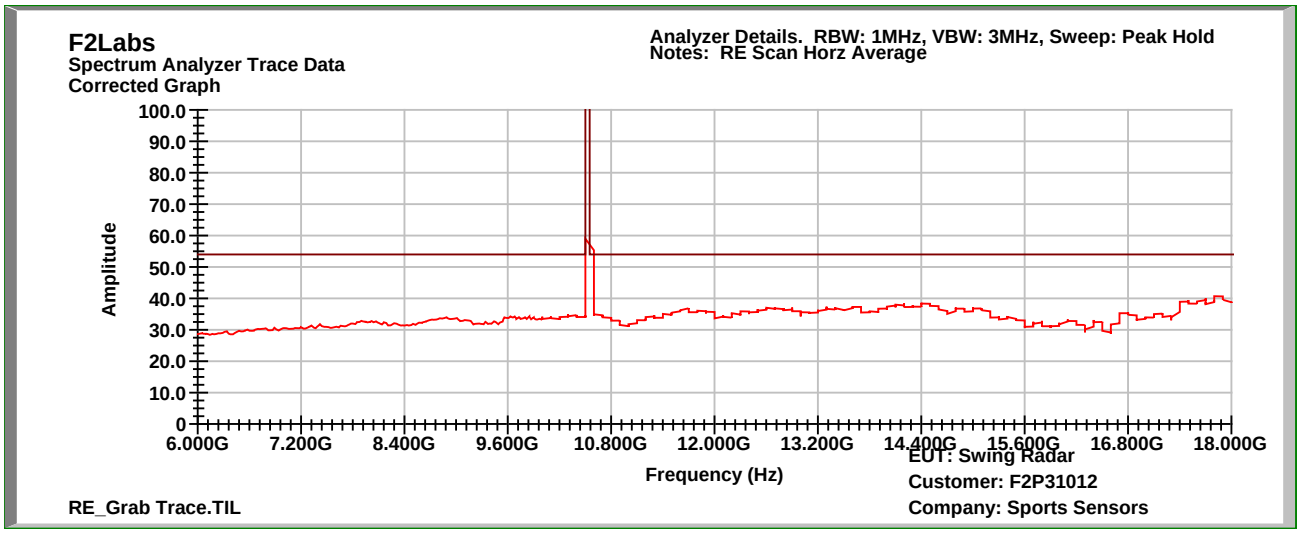
26 GHz to 40 GHz, Vertical



1 GHz to 6 GHz, Horizontal

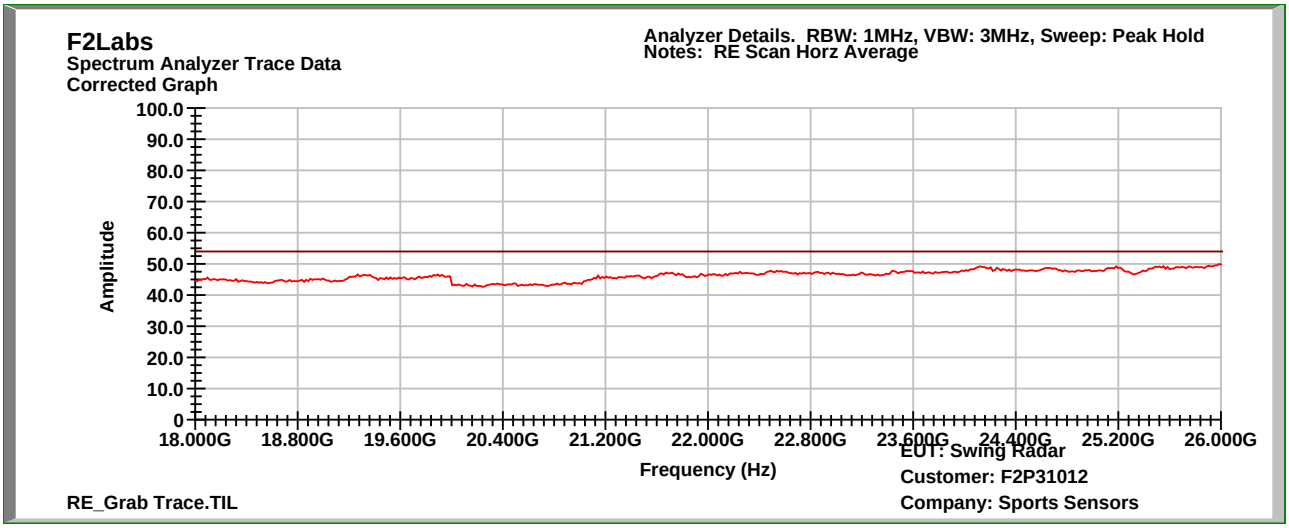


6 GHz to 18 GHz, Horizontal

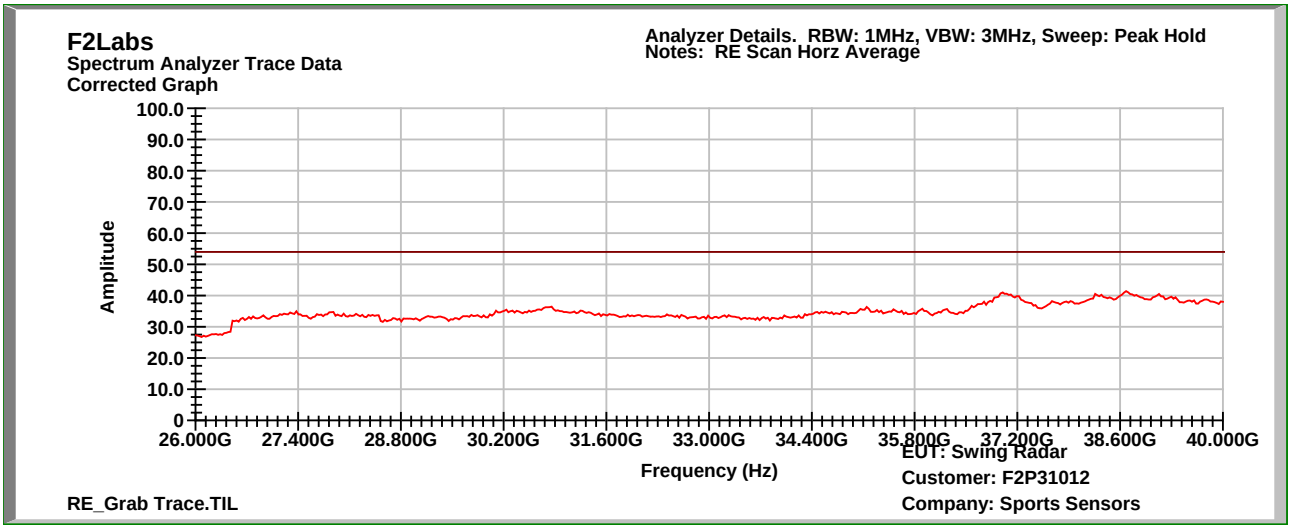


Note: The emissions seen in the 2.4 GHz range are the fundamental frequencies from a certified Bluetooth module inside the product. Those emissions are intentional radiator emissions and not spurious.

18 GHz to 26 GHz, Horizontal



26 GHz to 40 GHz, Horizontal



8 TEST SETUP PHOTOGRAPH(S)

Radiated Spurious Emission: 0.0009 MHz to 30 MHz

Radiated Spurious Emission: 30 MHz to 1000 MHz

Radiated Spurious Emission: Greater than 1 GHz